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A 3-D microstructural level model for analyzing the response of polymer bonded explosives DAVID HARDIN, MIN ZHOU, Georgia Institute of Technology — A three-dimensional finite element model is developed to study the microstructural level response of polymer-bonded explosives (PBX) under impact loading. The study focuses on the effect of the morphology and packing of energetic grains on the overall thermomechanical response of the composites. A cohesive finite element method (CFEM) is utilized to account for failure in the form of debonding between the HMX grains and the polymer matrix. Frictional heating along crack faces is tracked through a contact algorithm. Microstructures with cubic and multifaceted three-dimensional polygonal granules with packing densities between 0.42 and 0.74 are generated and used. Both 2D and 3D calculations are carried to analyze the differences between the models. To ensure consistency, the 2D microstructures are sections of the 3D microstructures. In this presentation, we will discuss differences in results from the 2D and 3D calculations, with a particular focus on the progression of damage and heating under impact loading.

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